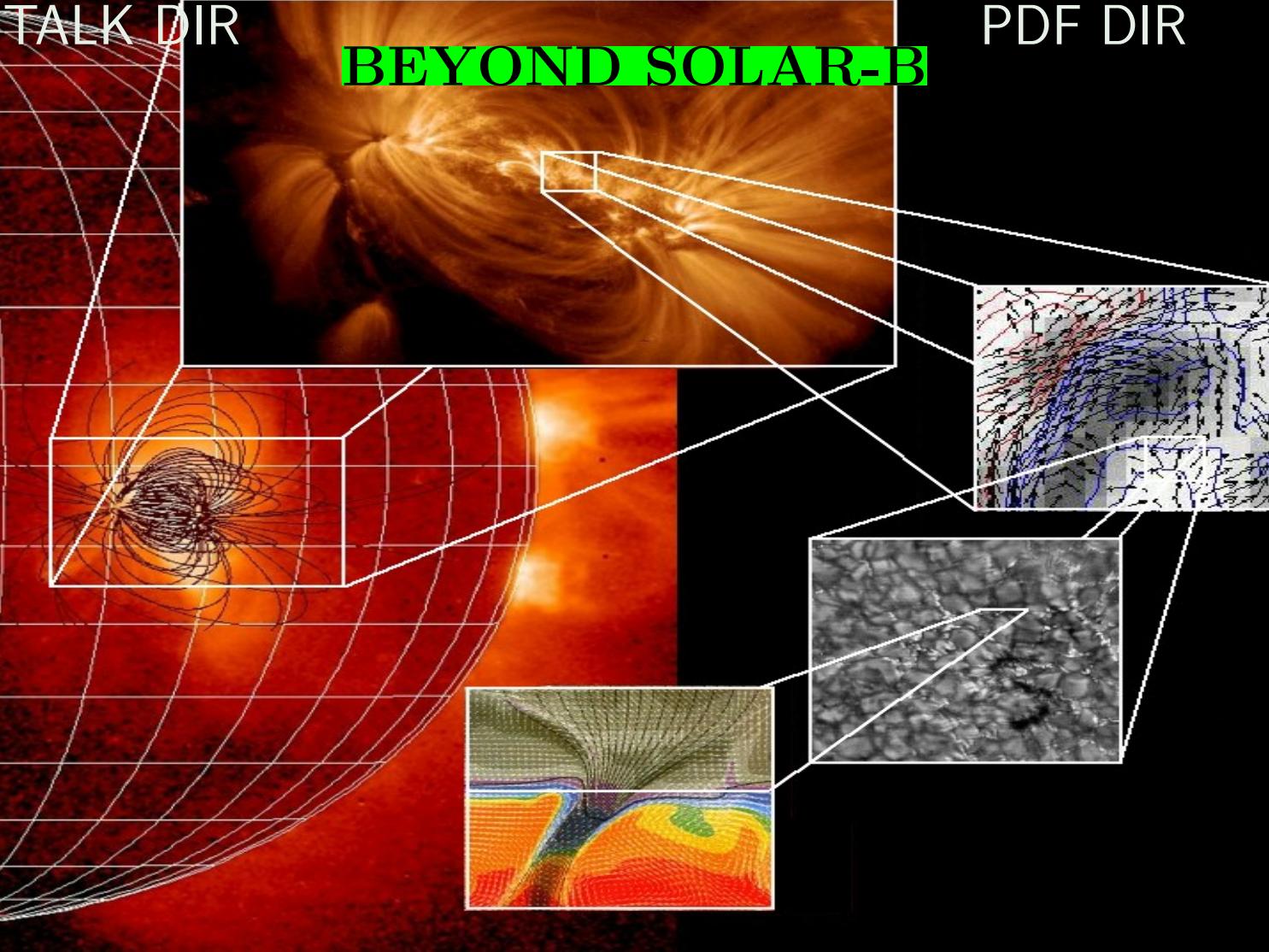


TALK DIR

PDF DIR

BEYOND SOLAR-B

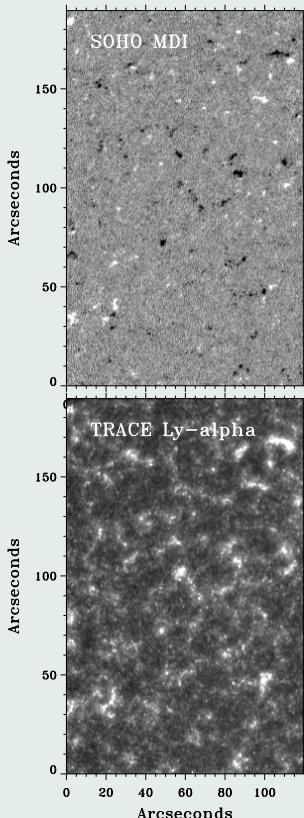


INTERNETWORK MAGNETISM

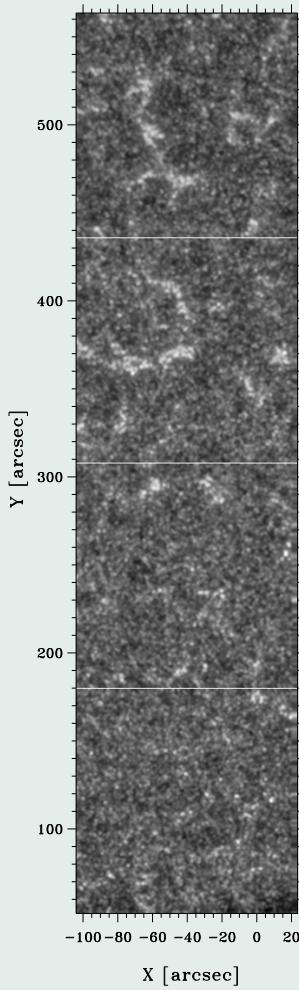
Rob Rutten

Sterrekundig Instituut Utrecht

“niet gehinderd door kennis van zaken”



- (inter-)network *physics*
 - what's there?
 - what isn't there yet?
 - photosphere – chromosphere – transition region
- (inter-)network *importance*
 - granules \Rightarrow tubes & canopies \Rightarrow loops
 - gas dynamics \Rightarrow MHD \Rightarrow plasma physics
 - astrophysics \Leftrightarrow heating \Leftrightarrow dynamo \Leftrightarrow cycle \Leftrightarrow climate
- (inter-)network *diagnostics*
 - subsubarcsec 3D(t) Doppler–Stokes spectrometry (GBO)
 - subsubarcsec wide & fast & long multi-wav movies (SBO)
 - subsubarcsec wide & fast & long 3D(t) simulations (CBO)



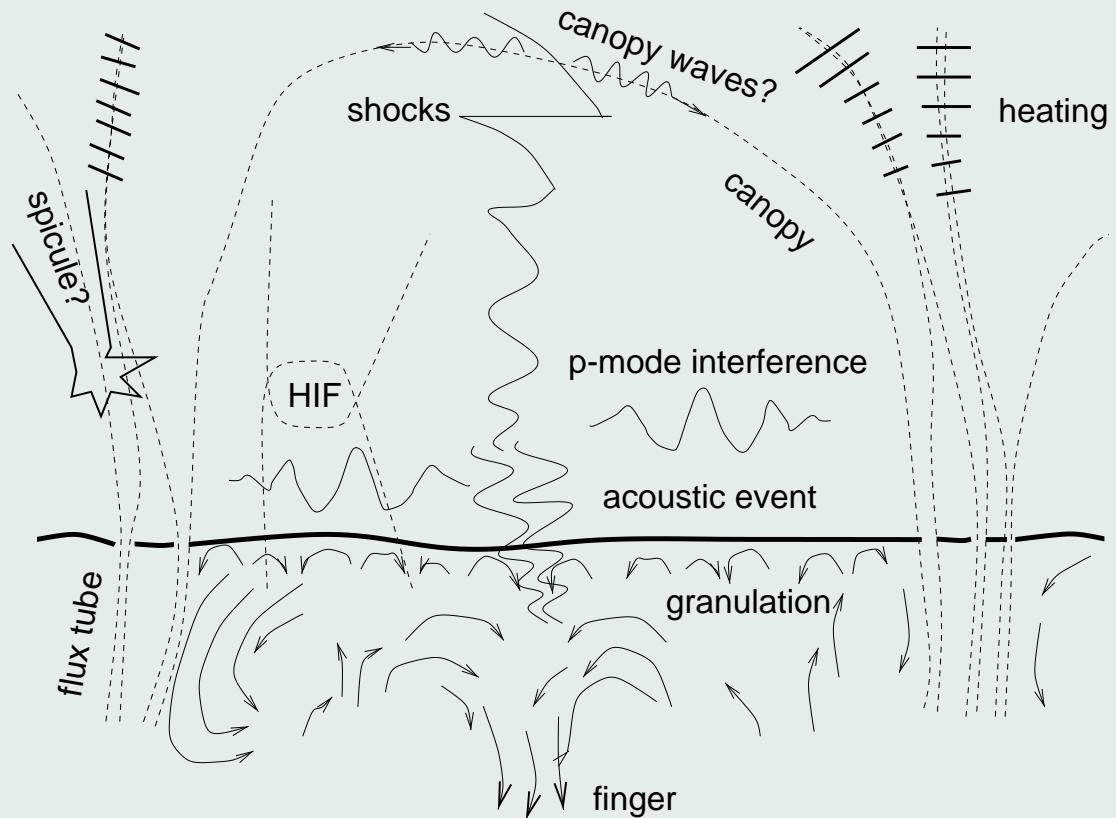
WHAT'S IN A NAME?

- *warnings*
 - intranetwork \neq internetwork
 - supergranulation \neq network
 - flux density \neq field strength
- *network*
 - magnetic network = chromospheric network
 - filigree grains = network BP's = Muller BP's
 - magnetic elements = fluxtubes = flux sheets
- *internetwork*
 - cell interior = inner network = non-network
 - cell flashes = cell BP's = Ca II K_{2V} grains
 - ephemeral regions ?=? flashers ?=? internetwork fields

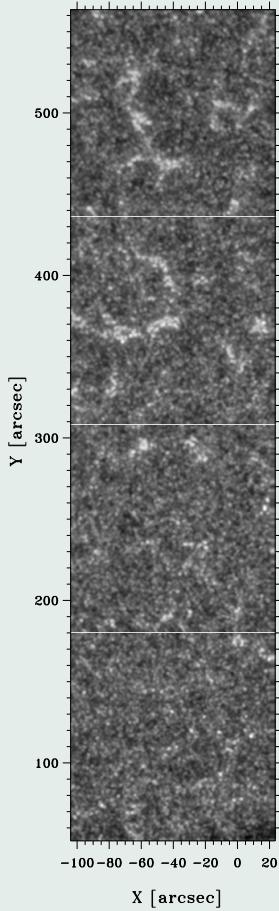
TRACE 1700 Å (*Krijger et al.*)

(INTER-)NETWORK SCENE

3rd ASPE Euroconference, ASP Conf. Series 184, 181, 1999



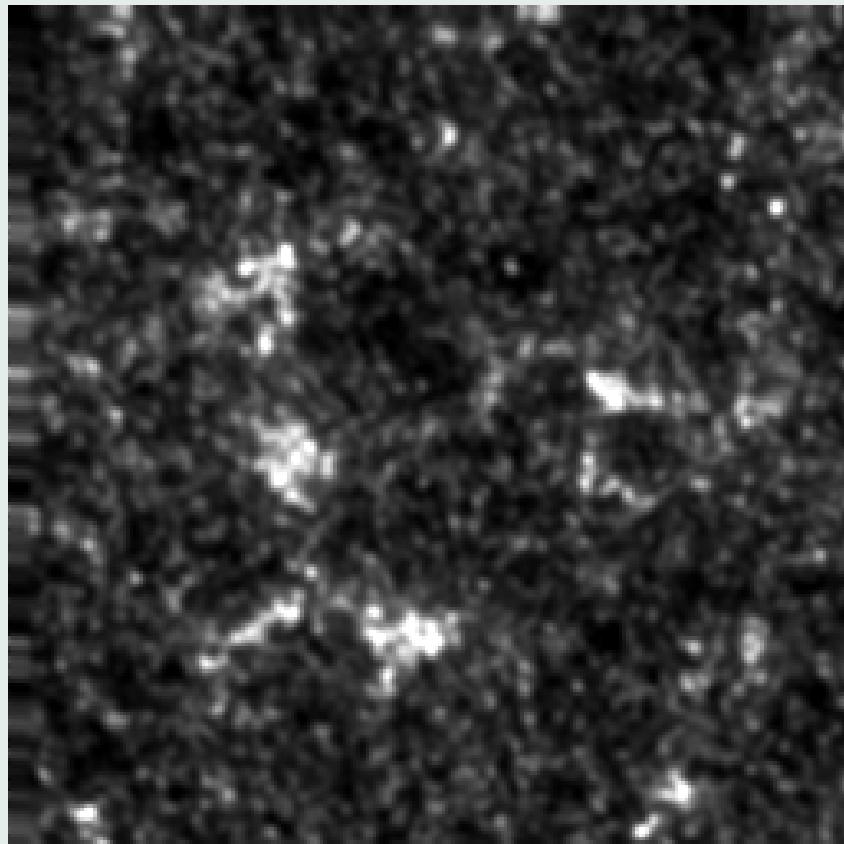
INTERNETWORK INGREDIENTS



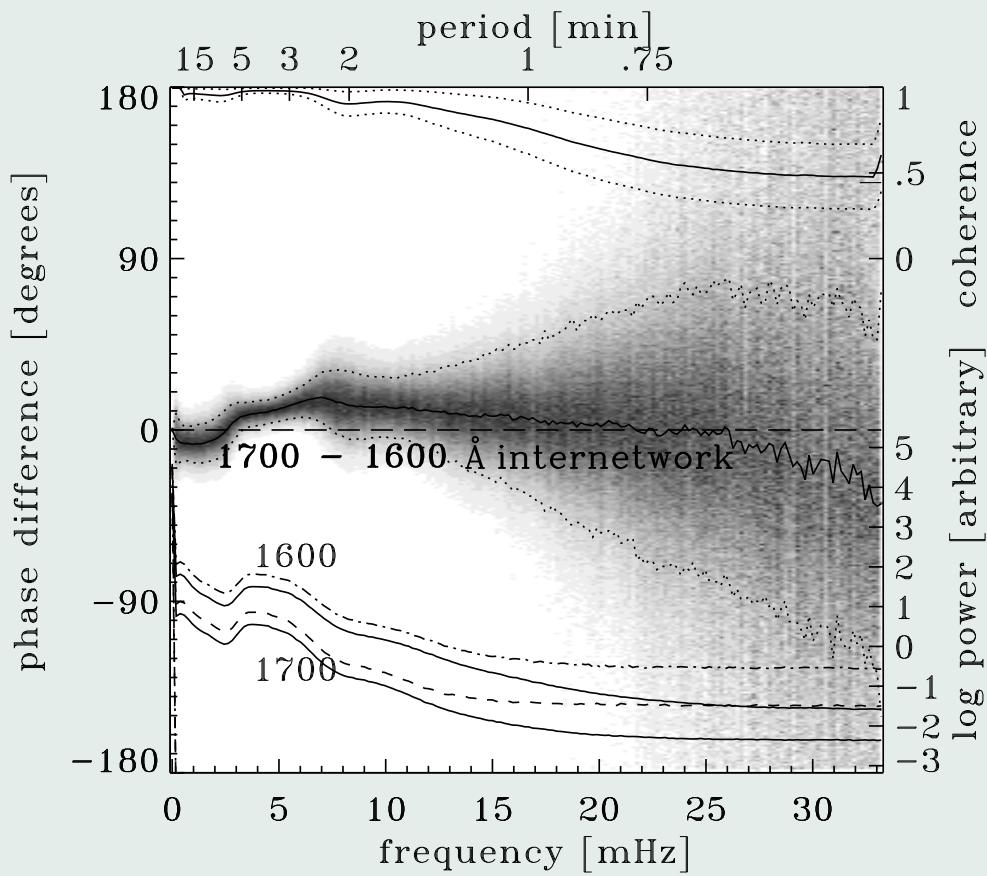
- *familiar*
 - granules and intergranular lanes
 - five-minute acoustic waves
 - three-minute acoustic (shock-)waves
 - ephemeral regions
- *less familiar non-magnetic*
 - mesogranular flows
 - internal gravity waves
- *less familiar magnetic*
 - persistent flashers (Brandt *et al.* 1992): loose fluxtubes?
 - HIF's (Lites *et al.* 1996): loose loops?
 - < 1400 G: non-magnetostatic fluxtubes?
 - < 100 G: non-tube weak fields?
 - < 10 G: truly diffuse fields?

TRACE WAVES

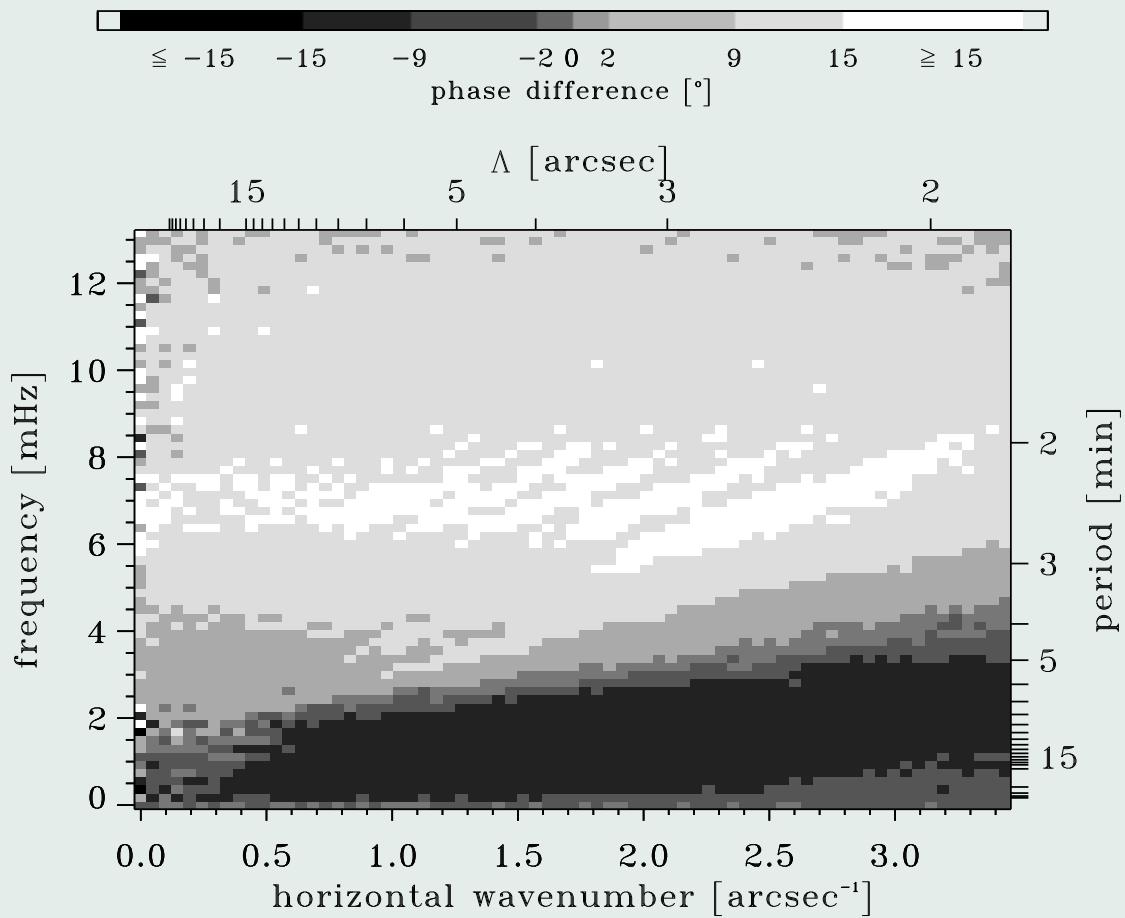
Krijger, Rutten, Lites, Straus, Shine & Tarbell, in preparation



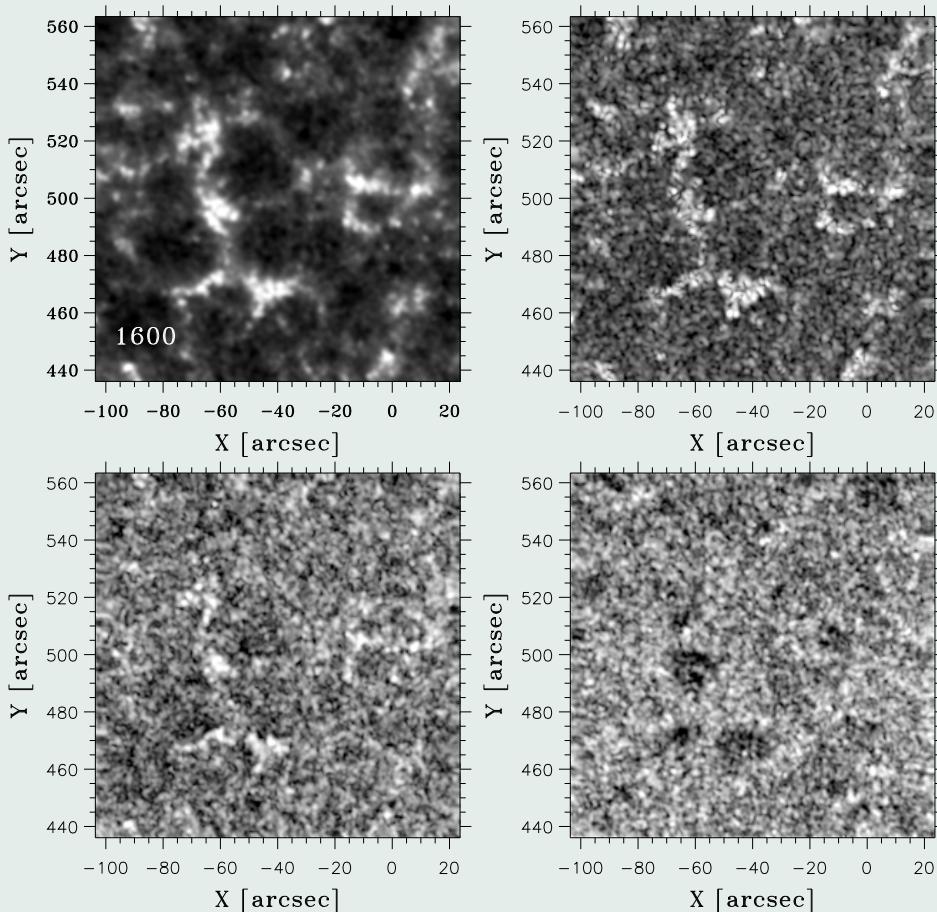
TRACE CONFUSOGRAM



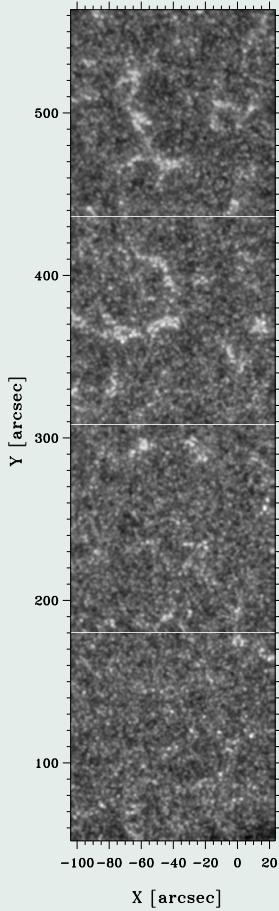
TRACE (f,k) DIAGRAM



TRACE POWER MAPS



INTERNETWORK INGREDIENTS



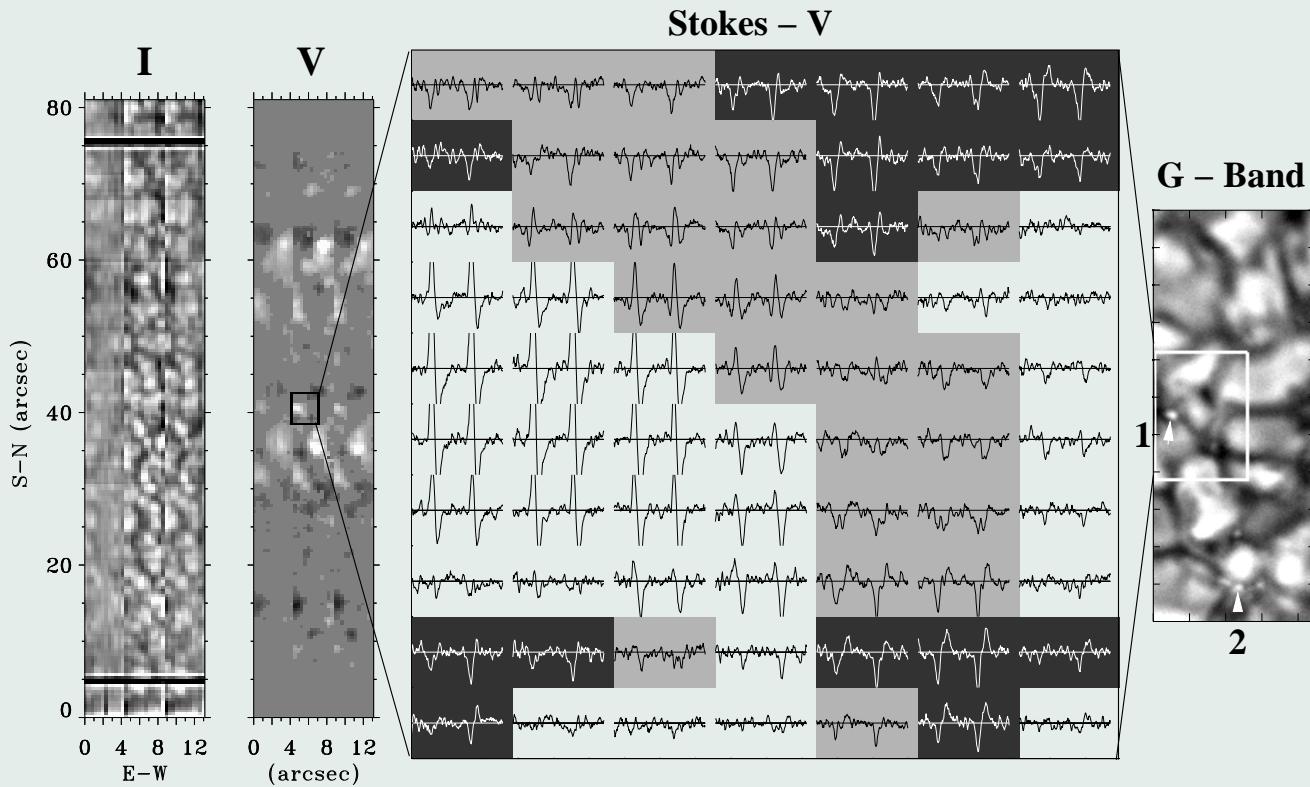
- *familiar*
 - granules and intergranular lanes
 - five-minute acoustic waves
 - three-minute acoustic (shock-)waves
 - ephemeral regions
- *less familiar non-magnetic*
 - mesogranular flows
 - internal gravity waves
- *less familiar magnetic*
 - persistent flashers (Brandt *et al.* 1992): loose fluxtubes?
 - HIF's (Lites *et al.* 1996): loose loops?
 - < 1400 G: non-magnetostatic fluxtubes?
 - < 100 G: non-tube weak fields?
 - < 10 G: truly diffuse fields?

INTERNETWORK FIELDS

- *Discovery*
 - Livingston & Harvey 1971 IAU Symp. 43
 - Livingston & Harvey 1975 BAAS 7 346
 - Smithson 1975 BAAS 7 346
- *Zeeman estimates*
 - Keller, Deubner, Egger, Fleck & Povel 1994 AA 286 626
 - Wang, Wang, Tang, Lee & Zirin 1995 SP 160 277
 - Lin 1995 ApJ 446 421
 - Lites, Leka, Skumanich, Martínez Pillet & Shimizu 1996 ApJ 460 1019
 - Meunier, Solanki & Livingston 1998 AA 331 771
 - Lin & Rimmeli 1999 ApJ 514 448
- *Hanle estimates*
 - Faurobert 1993 AA 268 765; 1994 AA 285 655
 - Faurobert, Feautrier, Machefert, Petrovay & Spielfiedel 1995 AA 298 289
 - Stenflo, Keller & Gandorfer 1998 AA 329 319
 - Bianda, Solanki & Stenflo 1998 AA 331 760

DST-ASP WITH AO

Sigwarth & Rimmele, NSO Newsletter



CONCLUSIONS

- *at present*
 - strong-tube bloom
 - non-collapsed tubes?
 - intrinsically weak fields?
- *near future*
 - large aperture AO + infrared Stokes
 - inversions & simulations
 - Hanle depolarization
- *far future*
 - topology physics?
 - dynamo?
 - heating?

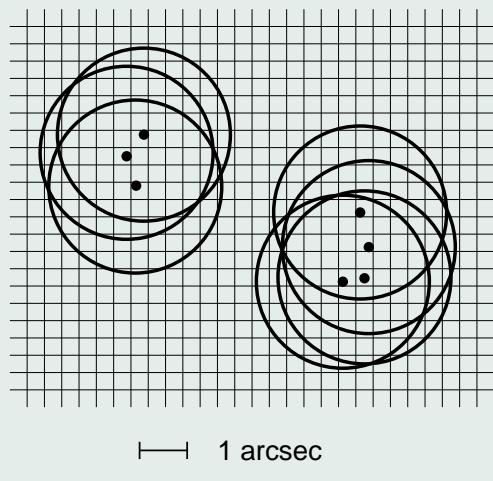
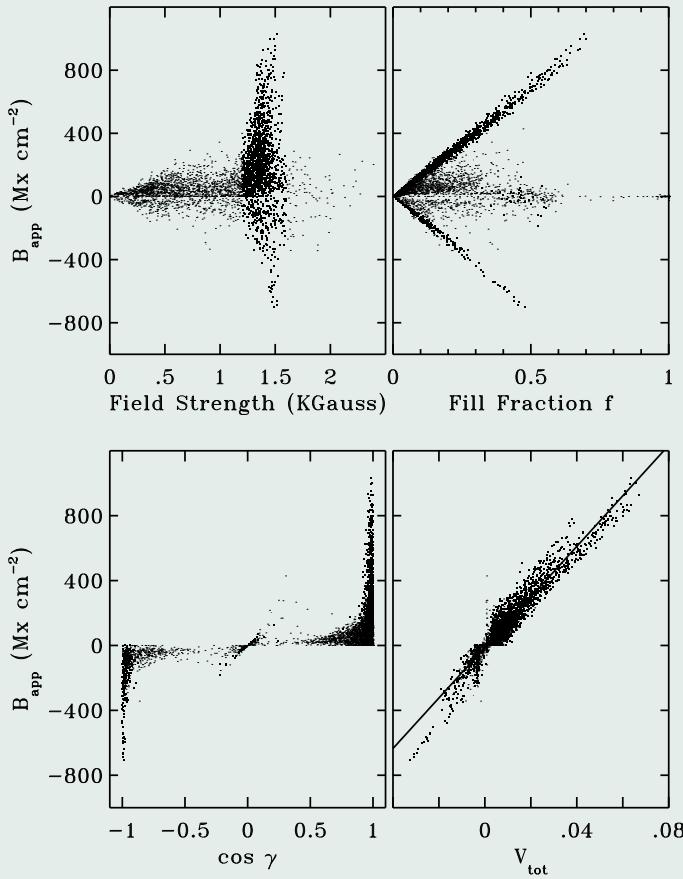
WORKSHOP MISSION STATEMENT

email Ron Moore Jan 8, 2001

- *What is the science problem and why is it important?*
 - relation to big questions?
 - relation to broad topics?
 - e.g., coronal heating, flares/CME's, luminosity modulation*
 - e.g., helioseismology*
- *What do we know now?*
 - what recent progress?
 - why is the topic hot?
- *What should we expect to learn before 2010?*
 - from Solar-B?
 - from ATST?
- *What need for high-resolution observations from space beyond 2010?*
 - not from Solar-B?
 - not from ATST?

FLUXTUBE BLOOM

Lites, Rutten & Berger 1999ApJ...517.1013L



1 arcsec

UTRECHT SOLAR PHYSICS

Universiteit Utrecht

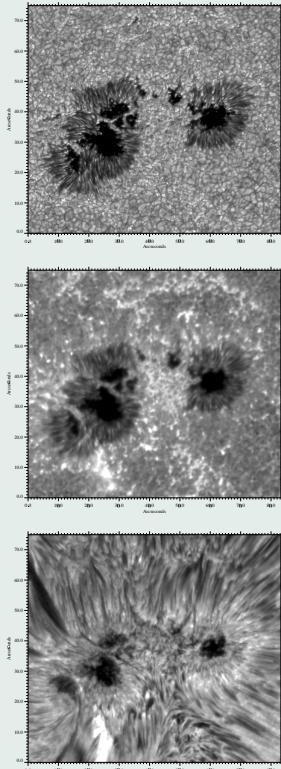


Sol Iustitiae Illustra Nos



- Past (*up to 15 out of 20 staff in solar physics*)
 - spectral line formation
 - MHD and plasma physics
 - cool-star magnetic activity
- Present (*2 out of 9 staff in solar physics*)
 - chromospheric oscillations
 - magnetic topology and dynamics
 - Dutch Open Telescope
- Future (*? out of ? staff in solar physics*)
 - **high-resolution proxy tomography?**
 - high-resolution Stokes polarimetry?
 - maintain PhD production?

DOT PROXY MAGNETOMETRY



- atmospheric tomography
 - three wavelengths: **G band**, **Ca II K**, **Halpha**
 - photosphere + low chromosphere + high chromosphere
 - with EUV: + corona
 - with tuned Ba II 4554: Dopplergrams
- high angular resolution
 - La Palma + DOT + speckle reconstruction
 - **consistently 0.2'' (45 cm diffraction limit)**
 - synchronously at all cameras (5)
- long duration
 - storage-limited (2.5 hrs @ 30 s cadence)
 - fairly frequent (seeing $r_0 > 6$ cm)
- large field
 - chip-limited (1296×1030 px = $92 \times 73''$)
 - hundreds of isoplanatic patches

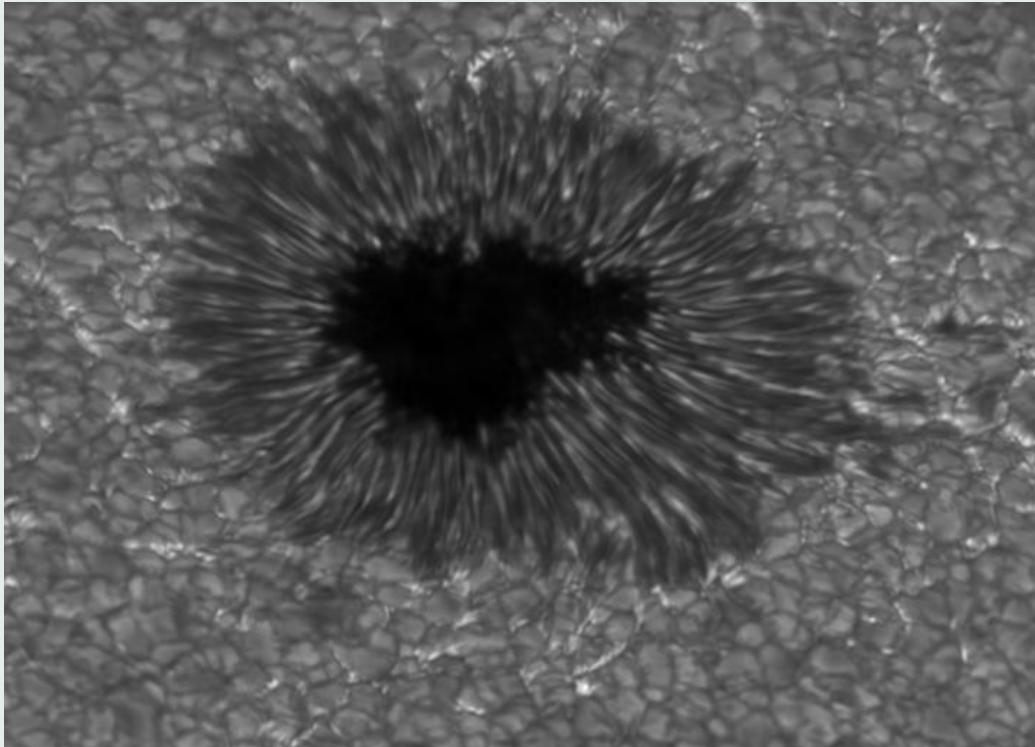
T.E. Berger, SVST[†]

DOT G-BAND MOVIE

<http://dot.astro.uu.nl>

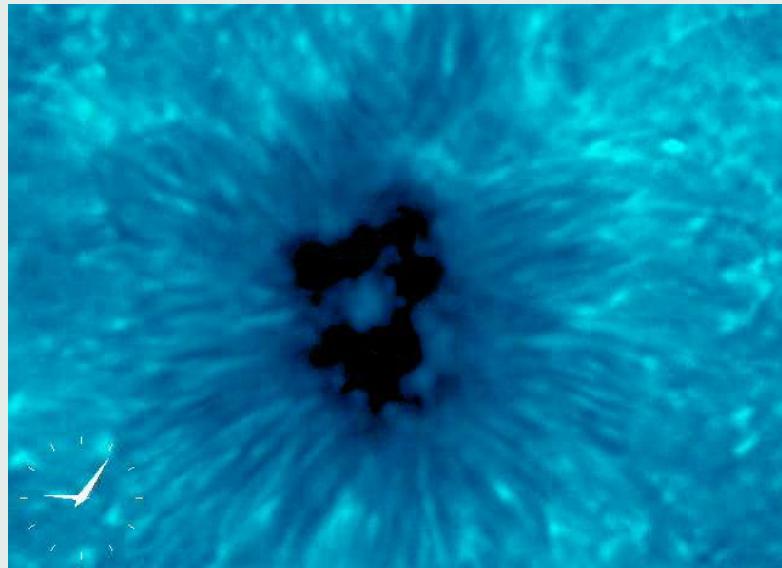
“Astronomy Picture of the Day”: Feb 23 2000

<http://antwrp.gsfc.nasa.gov/apod/astropix.html>



DOT Ca II K MOVIE

<http://dot.astro.uu.nl>



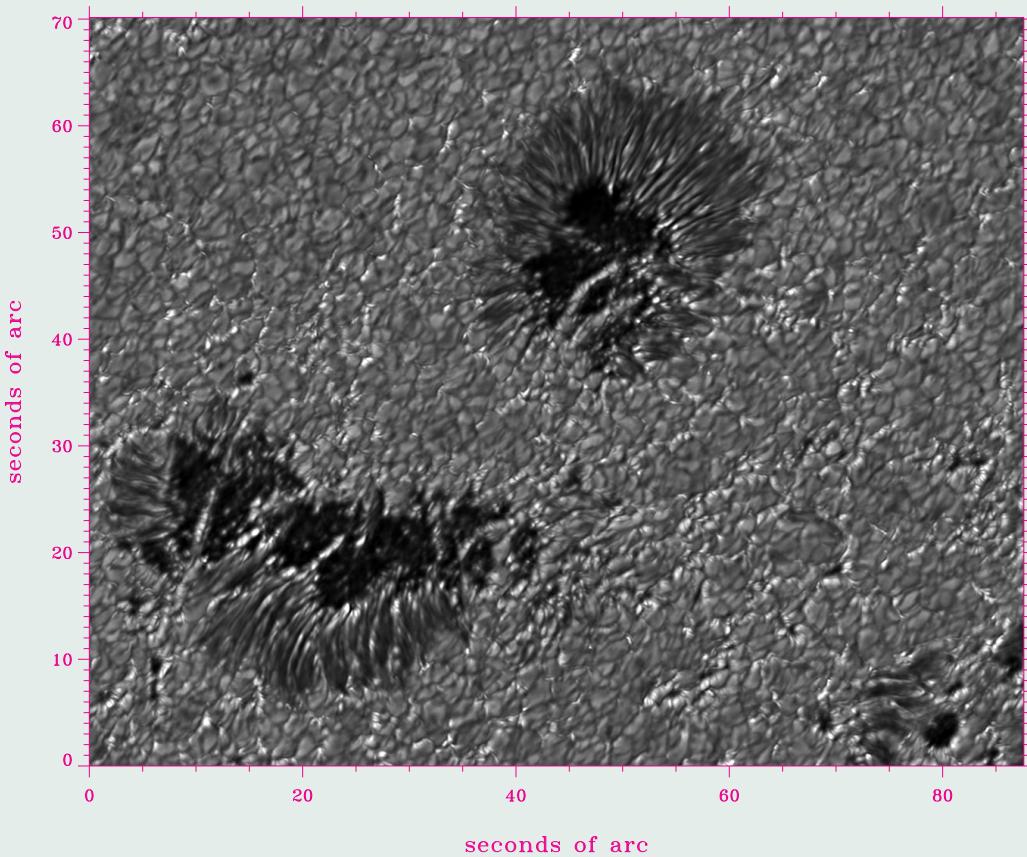
DOT H α MOVIE

<http://dot.astro.uu.nl>



DOT SPECKLE MOVIE

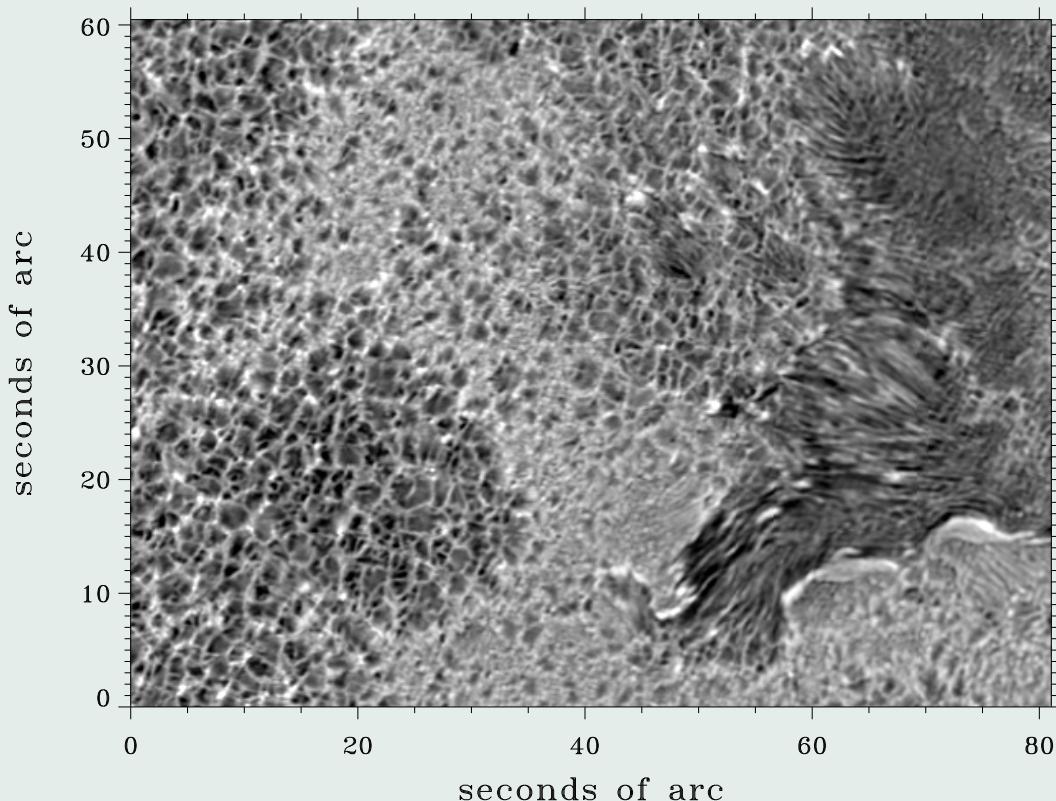
<http://dot.astro.uu.nl>



RADIAL VELOCITY

Sütterlin, Bettonvil, Skomorovsky & Domishev, SVST[†]

Ba II 4554 Dopplergram



TALK FILE TABLE

opener
ingredients
powermaps
conclusions
dotwavs
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dotgband
ba2doppler

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